

# TANDBERG DATA

Securing your Information



## DAT 160 and DAT 72 SCSI Tape Drive

*User Guide*

*Part Number 1018931 - August 2009*

[www.tandbergdata.com](http://www.tandbergdata.com)

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**Part Number** 1018931

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## About this guide

This guide provides information about:

- Installing the Tandberg Data DAT SCSI tape drive
- Using the Tandberg Data DAT SCSI tape drive
- Troubleshooting the Tandberg Data DAT SCSI tape drive

## Intended audience

This guide is intended for users who install, operate and maintain the Tandberg Data DAT tape drive.

## Technical support

For worldwide technical support information, please visit the support pages at <http://www.tandbergdata.com>.

Before contacting support, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

## Product warranties

For information about product warranties, please visit the support pages at <http://www.tandbergdata.com>.

## Document conventions and symbols

**Note:** Provides additional information.



**Warning** Indicates that failure to follow directions could result in bodily harm or death.



**Caution** Indicates that failure to follow directions could result in damage to equipment or data.



**Important** Provides clarifying information or specific instructions.

**Table 1** Document conventions

Convention	Element
Blue text: <a href="#">Table 1</a> on page X	Cross-reference links and e-mail addresses
Blue, underlined text: <a href="http://www.tandbergdata.com">http://www.tandbergdata.com</a>	website addresses
<b>Bold</b> text	<ul style="list-style-type: none"> <li>Keys that are pressed</li> <li>Text typed into a GUI element, such as a box</li> <li>GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes</li> </ul>
<i>Italic</i> text	Text emphasis
Monospace text	<ul style="list-style-type: none"> <li>File and directory names</li> <li>System output</li> <li>Code</li> <li>Commands, their arguments, and argument values</li> </ul>
<i>Monospace, italic</i> text	<ul style="list-style-type: none"> <li>Code variables</li> <li>Command variables</li> </ul>
<b>Monospace, bold</b> text	Emphasized monospace text

# 1

## Before you start

In this chapter:

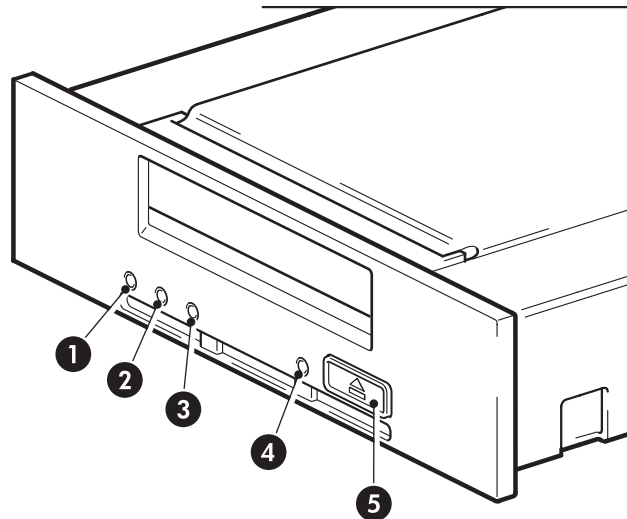
- “[DAT tape drive models](#)” on page 11
- “[Which operating systems are supported?](#)” on page 12
- “[How do I connect the drive to my server?](#)” on page 13
- “[Why is the SCSI bus type important?](#)” on page 14
- “[What are the mounting requirements for an internal tape drive?](#)” on page 14
- “[Drivers](#)” on page 15
- “[Backup software](#)” on page 15

### DAT tape drive models

This guide describes how to install and operate the following Tandberg Data DAT SCSI tape drive models:

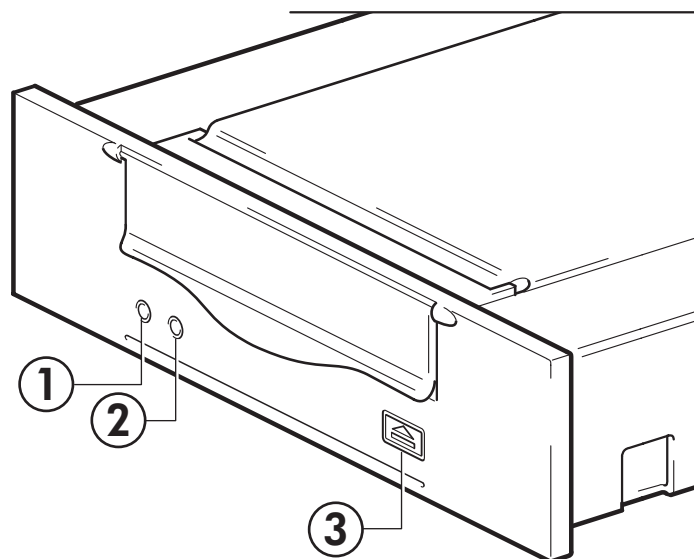
- Tandberg Data DAT 160 internal tape drive
- Tandberg Data DAT 72 internal tape drive

For a detailed product specification, please visit the support pages at <http://www.tandbergdata.com>.



- |              |                 |
|--------------|-----------------|
| 1. Clean LED | 4. Ready LED    |
| 2. Tape LED  | 5. Eject button |
| 3. Drive LED |                 |

**Figure 1-1** Front view of DAT 160 tape drive



- |              |                 |
|--------------|-----------------|
| 1. Clean LED | 3. Eject button |
| 2. Tape LED  |                 |

**Figure 1-2** Front view of DAT 72 tape drive

## Which operating systems are supported?

DAT tape drives can be connected to servers running under Windows®, Linux and other major operating systems. Please visit the support pages at <http://www.tandbergdata.com> for the most recent information about the operating system versions that are supported.

## How do I connect the drive to my server?

The following guidelines apply:

- For optimum performance the drive should be the only device on the SCSI bus.
- Always terminate the SCSI bus.
- Do not attach the drive to the same SCSI bus as your disk drive or to a RAID controller (unless you are connecting to a server with a Smart Array 6i RAID controller).

You will need a properly installed and configured SCSI host bus adapter (HBA) or a built-in SCSI controller on your server and a suitably-rated SCSI cable.

**Note:** Please visit the support pages at <http://www.tandbergdata.com> to ensure that you are connecting to a supported HBA running the recommended firmware version.

### Internal drives

The tape drive is installed into a spare, industry-standard, 5¼-inch drive bay in your server and is attached to the SCSI bus of the host server. Use an LVDS-compatible ribbon cable to connect the tape drive to a spare 68-pin, high density (HD), wide SCSI connector on the host server. The cable must be terminated.

### External drives

A 68-pin, wide, VHD-to-HD SCSI cable is required to attach the tape drive to the host server. If your server has an HD SCSI port, you must either purchase and install a VHD-to-HD adapter or use an HD-to-HD cable. please visit the support pages at <http://www.tandbergdata.com> for recommended products.

## Why is the SCSI bus type important?

The SCSI bus type determines the speed at which data can be transferred between devices on the bus and the maximum length of cable that can be used. The drives support a burst transfer rate of 160 MB/sec. To benefit from this level of performance, it is important to ensure that the drives are connected to a SCSI bus of a similar or higher specification. This means that you need:

- **An Ultra160 or Ultra320 SCSI bus.** If you attach the drive to a lower specification SCSI bus, it will still work but data will not be transferred as quickly.
- **LVD-rated SCSI cabling and terminators.** The LVD interface enables the data to be transferred at the drive's maximum rate.

**Note:** The drives are not compatible with high voltage differential (HVD) SCSI devices.

**Table 1-1** Supported SCSI bus types

SCSI Bus Type	Supported
Ultra160 LVD, Ultra320 LVD	<b>Yes.</b> These are <b>recommended</b> configurations.
Ultra2 LVD, Ultra Wide LVD	<b>Yes.</b> These are supported, but performance may be impaired.
Ultra wide, single-ended	Yes. But this is <b>not</b> a recommended configuration as it will restrict performance.
Ultra narrow, single-ended	Yes. But this is <b>not</b> recommended as it will severely restrict performance and you will need a suitable cable or adapter.
High Voltage Differential	<b>No.</b> The drive will not work and you may damage the drive or controller

## What are the mounting requirements for an internal tape drive?

You need one industry-standard, 5¼-inch, half-height bay in which to install the Tandberg Data DAT tape drive. For many servers, no mounting tray or rails are required. Devices simply slide into the server's chassis and are fixed with screws. Other servers have built-in trays or rails.

Some servers use non-standard mounting rails and do not include spares. If this is the case with your system, you will have to order these accessories from the server manufacturer before you can install the tape drive.

## Power requirements

Power requirements are:

**Table 1-2** Power requirements

Voltage	Typical Current		Maximum Current	
	DAT 160	DAT 72	DAT 160	DAT 72
5 V	1.54 A	0.7 A	1.61 A	0.8 A
12 V	0.26 A	0.3 A	1.3 A	1.0 A

## Drivers

One driver is required in order to use DAT SCSI tape drives.

The manufacturer's Tape driver is suitable for use in most applications, but refer also to the documentation of your software application to ensure you are using the recommended driver.

On Windows systems, we strongly recommend that you use the installer package supplied by your manufacturer to install the drivers. Updates to the drivers may be provided from time to time on <http://www.tandbergdata.com>. We recommend that these are installed after using the installer package.

On Linux and UNIX operating systems, drivers are included with the operating system and should be loaded automatically. To upgrade drivers we recommend that you patch to the latest version of the operating system.

## Backup software

For optimum performance it is important to use a backup application that is appropriate for your system's configuration. In a direct attach configuration, where the tape drive is attached to a standalone server, you can use backup software that is designed for a single server environment. In network configurations you will need backup software that supports enterprise environments.

Further details about suitable products can be found on <http://www.tandbergdata.com>. It is important to check for software compatibility and install any recommended upgrades.

**Note:** Certain backup applications require you to use their own Tape driver instead of the manufacturer's Tape driver.

**Note:** The NT backup application is compatible with DAT tape drives, but the user must always choose 4 mm tape even when using 8 mm tape with a Tandberg Data DAT 160 tape drive.



# 2

## Installing an internal DAT tape drive

In this chapter:

- [“Check the drive's SCSI ID”](#) on page 17
- [“Prepare mounting bay”](#) on page 18
- [“Attach mounting hardware”](#) on page 19
- [“Attach power and SCSI cables”](#) on page 21
- [“Secure the drive”](#) on page 23

Please refer to [“Installing an external DAT tape drive”](#) on page 25, if you are installing an external DAT tape drive.

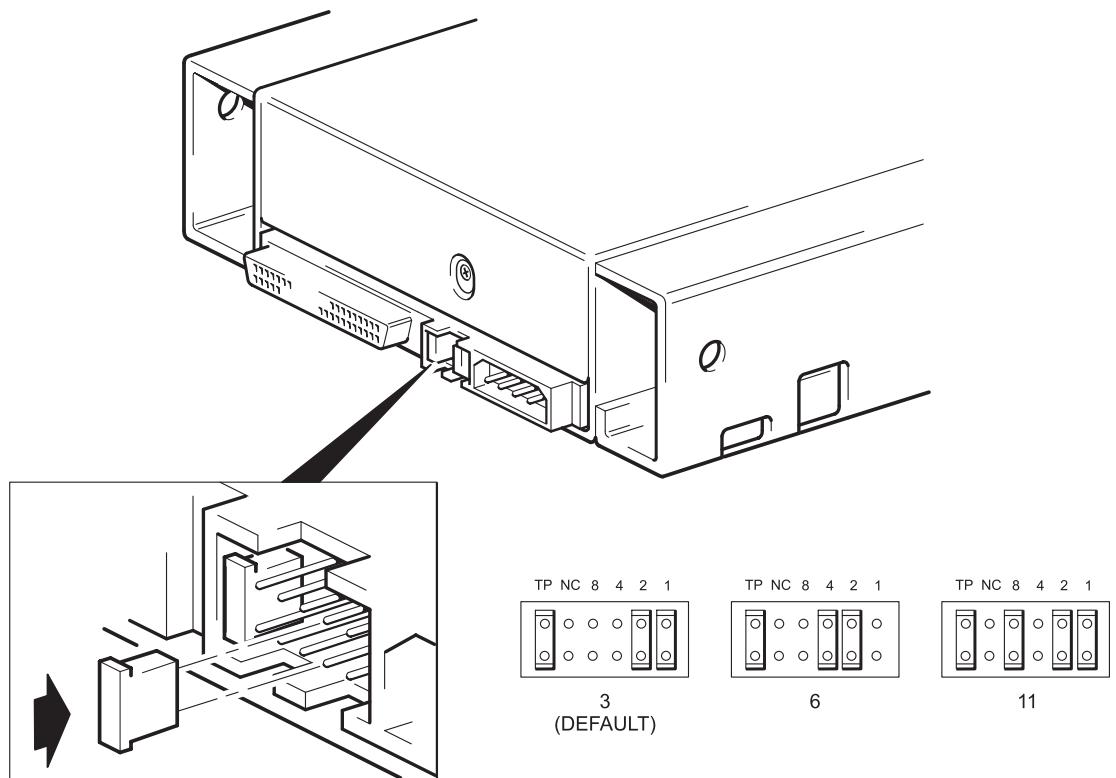
### Check the drive's SCSI ID

Your DAT drive is shipped with a default SCSI ID of 3. Each device on the SCSI bus must have a unique SCSI ID number. The drive can be assigned any *unused* ID between 0 and 15. Do not use SCSI ID 7, which is reserved for the SCSI controller. SCSI ID 0 is typically assigned to the boot disk and should also not be used unless the tape drive is on a dedicated SCSI bus.



#### Caution

Static electricity can damage electronic components. Always wear an antistatic wriststrap if possible. If not, to equalize the electromagnetic charges, touch a bare metal part of the server (such as the back plate) before you remove the tape drive from its bag.



**Figure 2-1** Checking the SCSI ID

1. Determine whether you need to change the SCSI ID from the default of 3.
2. Change the tape drive's SCSI ID, if necessary.

The SCSI ID is set using jumpers on a set of pins at the rear of the drive, as shown in figure 3. Use tweezers or small pliers to move the jumpers to the pattern corresponding to the ID you want. Do not remove the TP jumper. It should always be set.

**Note:** Spare jumpers will be attached to the drive. The drive is supplied with compression enabled. It can be disabled by removing the compression jumper, but this is not generally recommended.

## Prepare mounting bay

You need one industry-standard, 5¼-inch bay in which to install the DAT tape drive.



**Warning** To avoid personal injury or damage to the server or tape drive, ensure that the server is disconnected from the mains power supply while you install the drive.

**Caution**

Static electricity can damage electronic components. Always wear an antistatic wriststrap if one is available. If not, after you have disconnected power from the server and removed the cover, touch a bare metal part of the chassis. Similarly, touch a bare metal part of the drive before installing it.

1. Refer to your server documentation for detailed instructions and assemble the necessary tools and materials.
2. Perform a normal system shutdown and turn off the server and any connected peripherals.
3. Remove the cover and access panel from the server, as detailed in your server's documentation.

As you work inside the server, you may have to disconnect other signal cables or power cables from other devices to maneuver the new drive into place. If you have to do this, make a note of their position and connections so you can put them back correctly later.

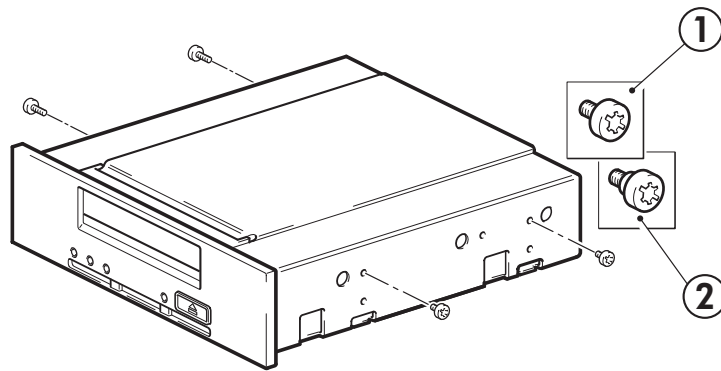
4. Remove the filler panel from a spare 5¼-inch bay of your server, as described in your server's documentation. With some servers you may also need to remove the half-height device divider. Keep any screws for use in ["Secure the drive"](#) on page 23.
5. You are now ready to install your tape drive.

## Attach mounting hardware

If your server requires special rails or other hardware to install the tape drive, mount them on the tape drive now. *If your server does not require special mounting hardware, ignore this section.*

Different models of server require different mounting methods. Please check your server documentation to ascertain the correct method of mounting, and to check whether mounting hardware is provided with the server or must be purchased separately.

**Note:** If mounting hardware is supplied with your tape drive, it may not be exactly the same as shown in the illustrations.



1. M3 mounting screws

2. M3 offset mounting screws

**Figure 2-2** Example, attaching mounting screws

## Install drive

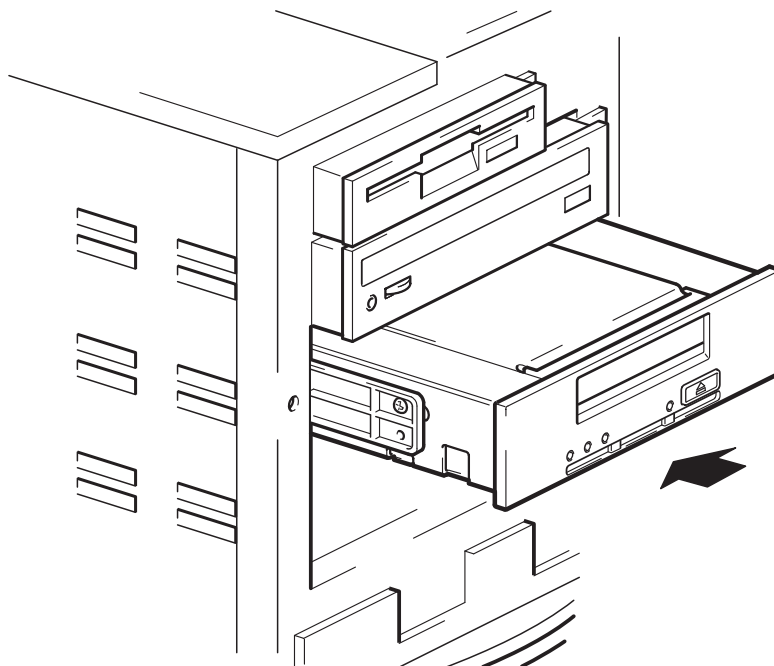


### Caution

Static electricity can damage electronic components. Always wear an antistatic wriststrap if one is available. If not, after you have disconnected power from the server and removed the cover, touch a bare metal part of the chassis. Similarly, touch a bare metal part of the drive before installing it.

---

Slide the tape drive into the open bay, aligning the tray or rails with the slots in the bay.



**Figure 2-3** Installing the tape drive

The illustration shows a tape drive that has mounting rails fitted. If your server does not use mounting hardware, check that the holes in the chassis are aligned with the holes in the side of the tape drive.

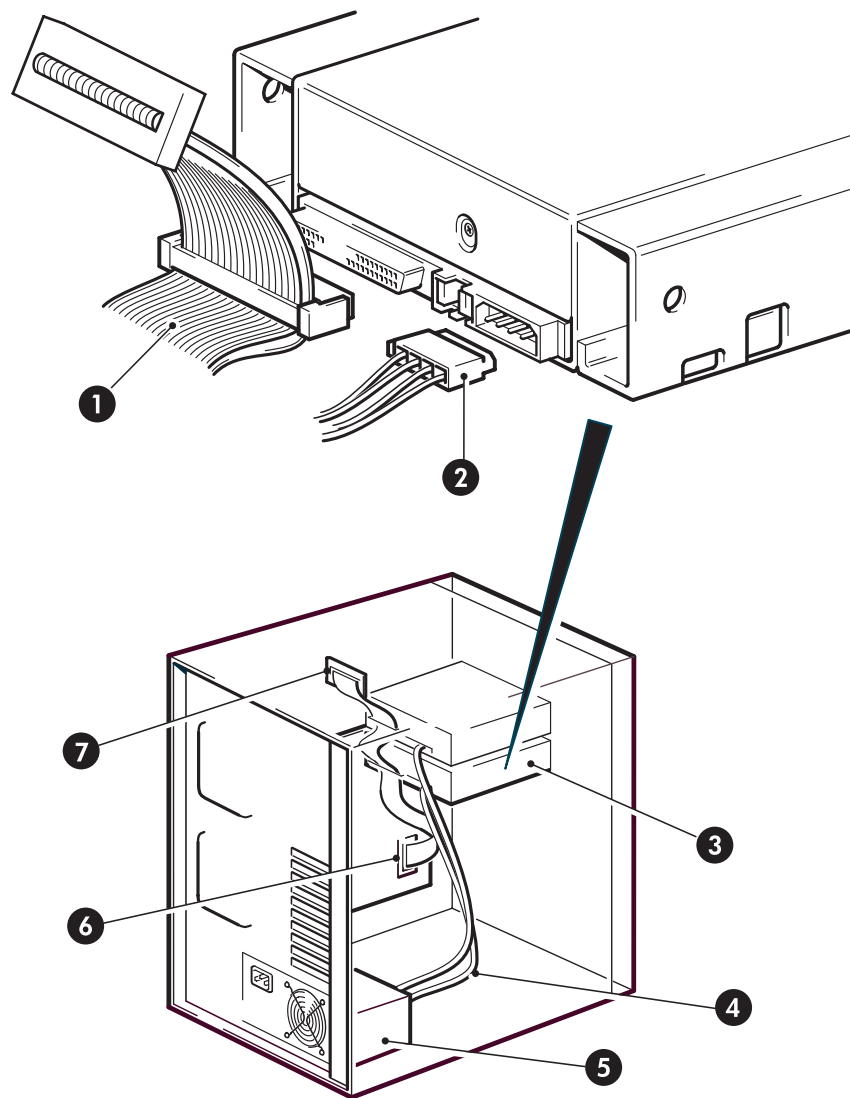
Do not secure the drive at this point because you may have to move the drive to get the cables into place.

## Attach power and SCSI cables

To support the high performance of the tape drive it is important that you connect to a recommended SCSI bus and use a suitably-rated SCSI cable, see [“Why is the SCSI bus type important?”](#) on page 14.

1. Check your server or HBA documentation to ensure that the SCSI bus and cabling supports up to Ultra160 bus speeds.
2. Attach a spare power cable from the server's internal power supply to the power connector, as shown in [Figure 2-4](#) on page 22.
3. Attach a spare connector on the server's built-in SCSI bus or HBA's SCSI ribbon cable to the SCSI connector of the drive, as shown in [Figure 2-4](#) on page 22.

4. If the drive is the last device on the SCSI chain, make sure that the SCSI cable is terminated correctly.



- |                                |                          |
|--------------------------------|--------------------------|
| 1 and 7. terminated SCSI cable | 5. server's power supply |
| 2 and 4. power cable           | 6. SCSI controller       |
| 3. tape drive                  |                          |

**Figure 2-4** Connecting power and SCSI cables

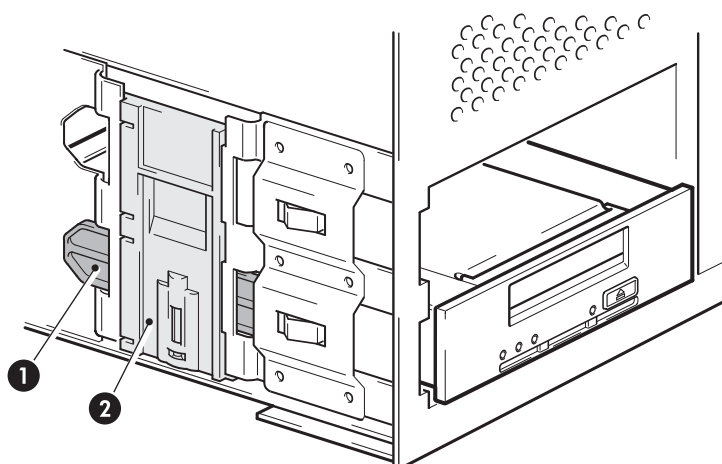
### Where should the SCSI terminator be?

Termination must be present at two and ONLY two positions on the SCSI bus—at the beginning of the SCSI bus and at the end of the SCSI bus. Termination is normally enabled by default on the HBA and most internal SCSI cables have a terminator attached. This will usually be a small, rectangular block of plastic attached to the cable end and marked 'SCSI Terminator'.

Therefore, assuming the HBA is the first device on the bus, you should check that the second terminator is placed after the last device, as shown in [Figure 2-4](#) on page 22, item 1.

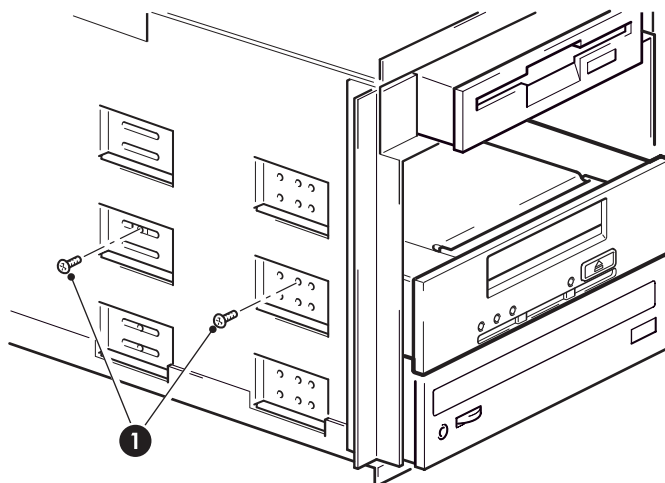
## Secure the drive

Secure the drive, as described in your server documentation. Ensure blanking plates are in place over empty bays and replace the cover on the server.



1. plastic rail
2. server latch, push down to lock the tape drive into position

**Figure 2-5** *Securing drive example 1, mounting hardware used*



1. M3 screws, supplied with tape drive

**Figure 2-6** *Securing drive example 2, no mounting hardware used*

## Notes



# 3

## Installing an external DAT tape drive

In this chapter:

- “[Check the drive's SCSI ID](#)” on page 25
- “[Connect the power cord](#)” on page 28

Please refer to “[Installing an internal DAT tape drive](#)” on page 17, if you are installing an internal DAT tape drive.

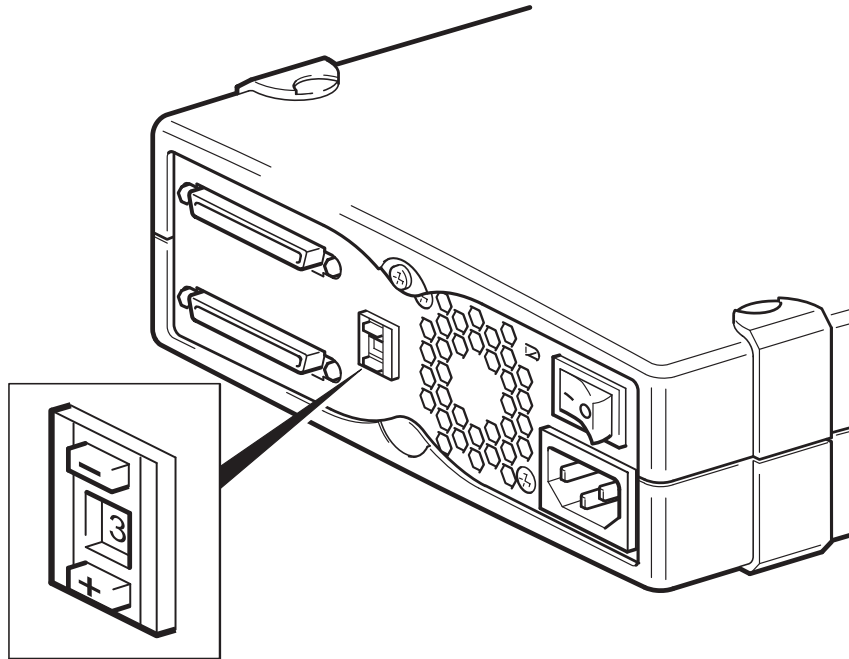
### Important information before you start

An external DAT drive will operate using any voltage in the range 100–240 volts (0.7 A, 50-60 Hz). No adjustment is needed.

A power cord and a SCSI cable are provided with your DAT tape drive.

### Check the drive's SCSI ID

Your DAT drive is shipped with a default SCSI ID of 3. Each device on the SCSI bus must have a unique SCSI ID number. The drive can be assigned any *unused* ID between 0 and 15. Do not use SCSI ID 7, which is reserved for the SCSI controller. SCSI ID 0 is typically assigned to the boot disk and should also not be used unless the tape drive is on a dedicated SCSI bus.



**Figure 3-1** Setting the SCSI ID

1. Determine whether you need to change the SCSI ID from the default of 3.
2. Change the tape drive's SCSI ID, if necessary.

Use a small screwdriver or a ball-point pen to press the indented SCSI ID selector buttons on the rear panel (see [Figure 3-2](#) on page 27) until the required value is displayed. Do not use a pencil because small bits of graphite could contaminate the drive.

**Note:** The computer and the tape drive SCSI IDs are only checked at power-on. To change the SCSI ID after installation, power down both the computer and the tape drive, change the drive's SCSI ID, power up the tape drive, and then power up the computer.

## Connect the SCSI cable

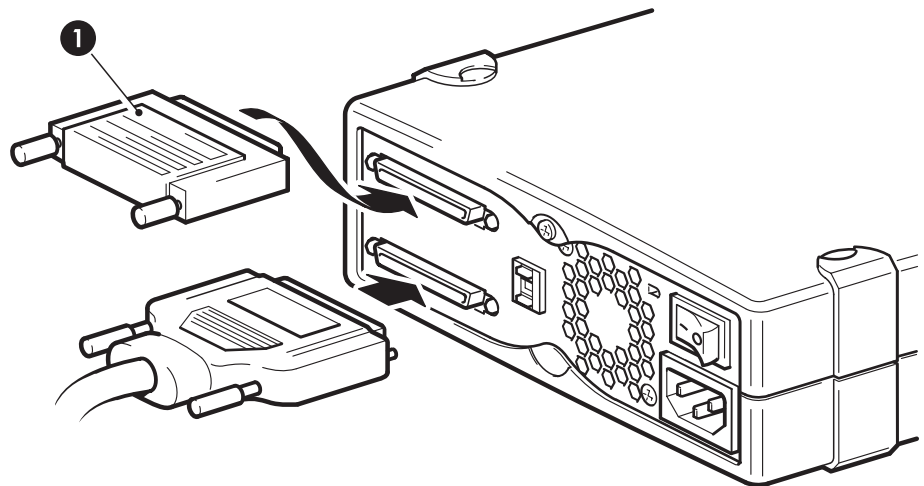
A wide VHD-to-HD SCSI cable and LVD terminator are required to connect your DAT tape drive to a VHD SCSI port on an LVD SCSI bus. If your server has an HD SCSI port, you must either purchase and install a VHD-to-HD adapter or use an HD-to-HD cable. Please visit the support pages at <http://www.tandbergdata.com> for recommended products.



### Caution

To avoid damaging the computer or tape drive, ensure that both are powered off while you attach the SCSI cable.

1. Make sure you are connecting to a recommended SCSI bus type. See “[Why is the SCSI bus type important?](#)” on page 14. Do not connect the tape drive to the same bus as a RAID controller. For optimum performance, we recommend that your DAT drive is installed on a dedicated SCSI bus. If it is not, do not connect it to the same bus as your disk drive.
2. Perform a normal system shutdown and turn off the server and any connected peripherals.
3. Attach the VHD connection on the SCSI cable to the server's external SCSI connector and secure it by tightening the screws.



1. LVD SCSI terminator

**Figure 3-2** Connecting the SCSI cable

4. Attach the HD connection on the SCSI cable to one of the SCSI connectors on the rear panel of the tape drive and secure it by tightening the screws.
5. Connect the LVD terminator to the drive's other SCSI connector and tighten the screws to secure it.

### Why does the tape drive need a terminator?

Terminators are essential, as they provide the correct voltages on the SCSI bus and prevent unwanted signal reflections from interfering with data transfers. The rule is:

**There must be termination at both physical ends of the bus and only at the ends.**

Normally the HBA forms one end of the SCSI bus and provides termination. You, therefore, need to ensure that the other end of the bus is terminated. If the tape drive is at the end of the SCSI bus, the terminator must be attached to the tape drive.

If you want to attach additional devices to the SCSI bus after the tape drive, you will need to remove the SCSI terminator and attach the next device to

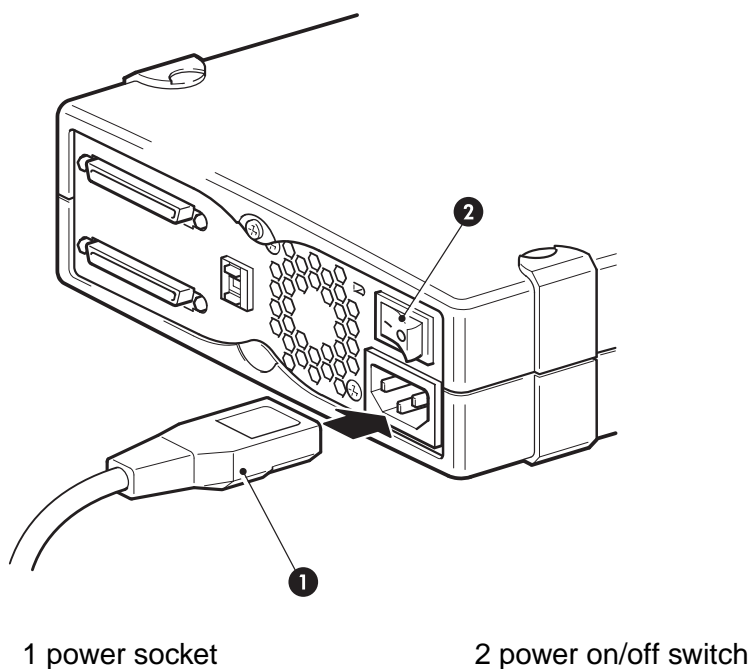
this SCSI connector. Make sure that you attach the terminator to the last device in the chain.

Always use an LVD terminator (supplied with the tape drive) or a multimode terminator. See “[SCSI termination](#)” on page 52 for more information about SCSI cables and termination.

## Connect the power cord

An external DAT drive will operate using any voltage in the range 100–240 volts (0.7 A, 50-60 Hz). No adjustment is needed. To connect your drive to the power supply, proceed as follows:

1. Make sure that the drive is switched OFF (O side down). The power switch is on the rear panel.
2. Plug the power cable securely into the socket on the rear panel of the drive.
3. Plug the other end of the power cable into the power outlet.



**Figure 3-3** Connecting the power cable

# 4

## Verify installation

Once you have installed the drive hardware, check that drivers have been installed correctly and you have the correct version of backup software, and verify that the tape drive is functioning properly before you store your valuable data.

**Note:** Certain backup applications require you to use their own Tape driver instead of the HP Tape driver.

1. Switch on the drive and the server.
2. The tape drive will run its hardware self-test, which takes about 5 seconds. At the end of the hardware self-test:
  - **DAT 160 drives:** If self-test passes, the green Ready LED flashes and then shows steady green. If the test fails, the Drive Error and Tape Error LEDs flash, while the Ready and Clean (or Use Cleaning Cartridge) LEDs are off. This continues until the drive is reset.
  - **DAT 72 drives:** If self-test passes, both front panel lights should be off. If a hard error causes the self-test to fail, the clean light changes to steady amber.  
See “[Front panel](#)” on page 32 for more information about front panel lights.
3. Make sure the correct drivers are installed.
  - **Installing drivers (Windows)**  
We recommend that you download the latest driver from <http://www.tandbergdata.com> before installation. If the Windows Found New Hardware wizard runs, follow the on-screen instructions to install drivers from the download location.
  - **Installing drivers (other operating systems)**  
Drivers are included with the operating system and should be loaded automatically. To upgrade drivers we recommend that you patch to the latest version of the operating system.

4. Verify that the tape drive installation was successful.

If you encounter a problem during this verification procedure, turn to “[Troubleshooting](#)” on page 45 for help in diagnosing and fixing the problem.

5. For all operating systems ensure that you have downloaded any upgrades necessary for your backup application. Check <http://www.tandbergdata.com> for software compatibility and install any recommended upgrades.

6. Carry out a backup and restore test to check that the drive can write data to tape. Use a blank cartridge.

Native backup applications can be used to check basic tape drive operation, but they may not support all the advanced features of your tape drive. We recommend that you upgrade your software application before running this test.

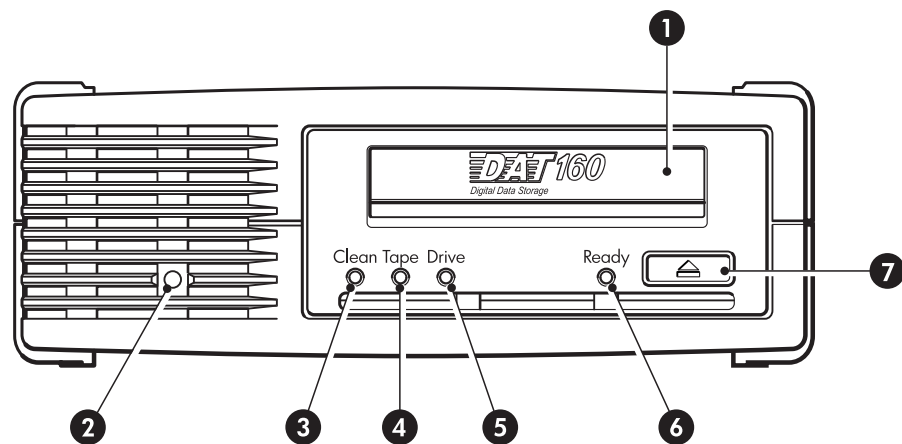
# 5

## Operating your tape drive

In this chapter:

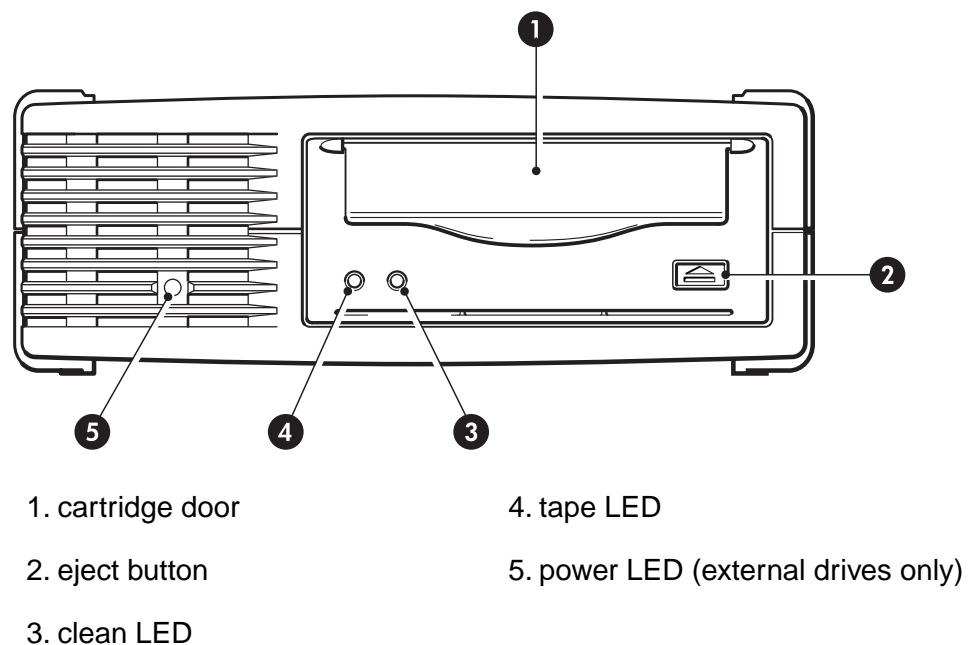
- “[Front panel](#)” on page 32
- “[LED sequences](#)” on page 32
- “[Loading and unloading cartridges](#)” on page 36
- “[Removing power from the drive](#)” on page 37

## Front panel



- |                                     |                 |
|-------------------------------------|-----------------|
| 1. cartridge slot                   | 5. drive LED    |
| 2. power LED (external drives only) | 6. ready LED    |
| 3. clean LED                        | 7. eject button |
| 4. tape LED                         |                 |

**Figure 5-1** Front panel, DAT 160 tape drive



- |                   |                                     |
|-------------------|-------------------------------------|
| 1. cartridge door | 4. tape LED                         |
| 2. eject button   | 5. power LED (external drives only) |
| 3. clean LED      |                                     |

**Figure 5-2** Front panel, DAT 72 tape drive

## LED sequences



## LED sequences for the DAT 160 tape drive

The meaning of different patterns of LEDs is as follows:

**Table 5-1** LED sequences for DAT 160

LED Sequence	Cause	Action required
<i>All LEDs OFF.</i>	Drive may not have power, may be faulty or may have been power cycled or reset during a firmware upgrade.	<p>Make sure the drive is switched on. The power on/off switch incorporates a green LED.</p> <p>If this is not on, check the power cable connection and replace the cable if necessary. You can use the power cable from your monitor or another device to check that the connection is working.</p> <p>If the power supply is present and all LEDs remain off, power cycle or reset the drive. If it still fails, call for service.</p>
<i>Ready is ON.</i>	The drive is ready for operation.	None. This is normal.
<i>Ready FLASHES.</i>	The drive is carrying out a normal activity (read, write, clean).	<p>None.</p> <p>If the drive is upgrading firmware, do not reset or power cycle it.</p> <p>If the drive is cleaning, the cleaning cartridge will eject on completion. The cleaning cycle can take up to 5 minutes to complete.</p>
<i>Clean FLASHES.</i>	The drive requires cleaning.	<p>Load the DDS cleaning cartridge. See <a href="#">“Cleaning cartridges”</a> on page 41 for supported cartridges and instructions.</p> <p>If the Clean LED is still flashing when you load a new or known good data cartridge after cleaning, call for service.</p>

**Table 5-2** LED sequences for DAT 160, continued

LED Sequence	Cause	Action required
<i>Tape FLASHES.</i>	The drive believes the current tape or the tape just ejected is faulty.	<p>Unload the tape cartridge. Make sure that you are using the correct format cartridge. (See “<a href="#">Use the correct media</a>” on page 39.)</p> <p>Reload the cartridge. If the Tape LED still flashes or starts flashing during the next backup, load a new or known good cartridge.</p> <p>If the Tape LED is now off, discard the 'suspect' tape cartridge. If it is still on, call for service.</p>
<i>Drive FLASHES.</i>	The drive mechanism has detected an error.	<p>Load a new cartridge. If the error persists, power cycle or reset the drive.</p> <p>If the Drive LED remains on, call for service.</p>
<i>Drive, Tape and Ready FLASH.</i>	There is a firmware download problem.	<p>Insert a cartridge to clear the LED sequence. If the condition persists, call for service.</p>

### LED sequences for the DAT 72 tape drive

There are two LEDs, labeled Tape and Clean. The meaning of different patterns of LEDs is as follows:

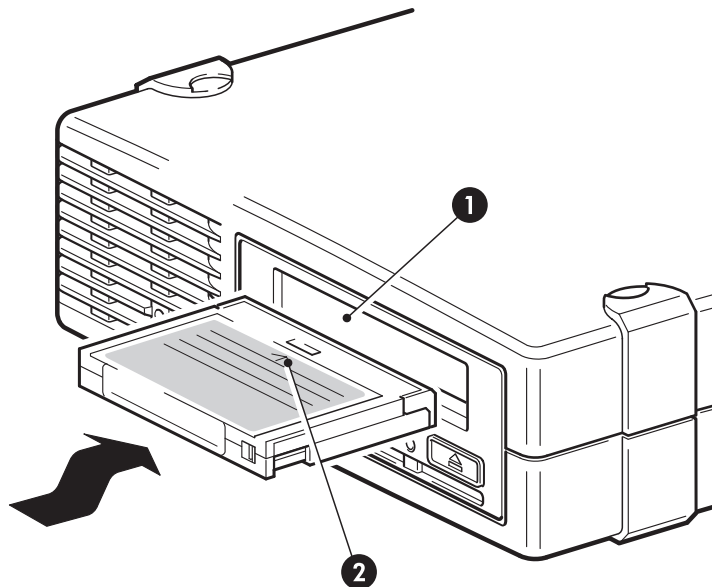
Tape LED	Clean LED	Meaning
on	off	The cartridge is loaded and the drive is ready.
flashing slowly	off	The cartridge is loading or unloading, or self-test is in progress.
flashing rapidly	off	The cartridge is loaded, activity is occurring.
off or flashing	on	This is the Error Condition Signal. DAT drives perform a comprehensive self-test during power-up. If a hard error causes the self-test to fail, the clean light changes to steady amber.
off or flashing	flashing slowly	<p>This is the Media Caution Signal.</p> <ol style="list-style-type: none"> <li>1. Wait for the current operation to finish, then insert a different tape and repeat the operation that was being performed.</li> <li>2. If the media caution signal does not show this time, it indicates that the original cartridge was nearing the end of its useful life. Copy any data you want to keep from the original tape onto a new tape if possible, then discard the old tape.</li> <li>3. If the media caution signal appears again with the second tape, the tape heads need cleaning.</li> <li>4. If the media caution signal appears after using a cleaning cartridge, the cleaning cartridge has probably expired and should be discarded.</li> </ol>

## Loading and unloading cartridges

### Inserting cartridges

1. Insert a cartridge into the slot on the front panel. As the cartridge is inserted, the drive takes it and performs a load sequence.

**Note:** The illustration shows a DAT 160 cartridge. These cartridges are wider than earlier-format DDS cartridges and can only be used with DAT 160 tape drives. See “[Data cartridges](#)” on page 39 for more information about tape drive and cartridge compatibility.



1. cartridge slot
2. arrow indicates leading direction

**Figure 5-3** Inserting a data cartridge (into a DAT 160 external drive)

2. **DAT 160 tape drives:** The Ready light flashes green while the drive performs its load sequence. When the cartridge is loaded, the Ready light shows steady green.

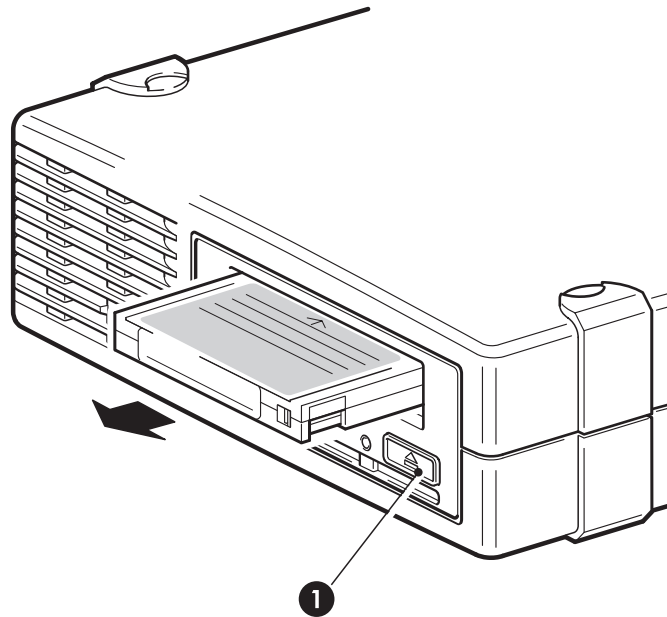
**DAT 72 tpe drives:** The Tape light flashes green while the drive performs its load sequence. When the cartridge is loaded, the Tape light shows steady green.

## Removing cartridges



**Caution** Never try to remove a cartridge before it is fully ejected.

1. Press the Eject button on the front panel.



1. eject button

**Figure 5-4** *Ejecting a cartridge (from an external drive)*

2. The drive completes any task it is currently performing, winds the tape to the beginning, and ejects the cartridge. The sequence will take about 25 seconds for a write-enabled cartridge and 10 seconds for a write-protected cartridge.

## Removing power from the drive

To ensure reliable operation, do not remove power from the drive during read, write, fast-search, load and unload activities.

## Notes

# 6

## Use the correct media

For best performance we recommend branded media, as recommended by your manufacturer.

In this chapter:

- “[Data cartridges](#)” on page 39
- “[Write-protecting cartridges](#)” on page 40
- “[Cleaning cartridges](#)” on page 41
- “[Handling cartridges](#)” on page 42
- “[Getting the most out of cartridges and drives](#)” on page 42

### Data cartridges

#### DAT 160 tape drives and DAT 160 cartridges

DAT 160 cartridges can only be used with DAT 160 tape drives; they are wider than earlier formats and will not fit into earlier tape drive models. DAT 160 cartridges provide optimum performance and maximum capacity for DAT 160 tape drives. DAT 160 tape drives are also backwards compatible with some earlier formats, see [Table 6-1](#) on page 40.

#### Compatibility

For optimum performance and storage capacity, use tape cartridges that match your drive's format, and normally use only one cartridge per day. Ideally, use:

- DAT 160 cartridges with DAT 160 tape drives

- DAT 72 cartridges with DAT 72 tape drives

Although DDS tape drives are fully backward compatible, old tape formats are more abrasive than later generations and using older tape formats can reduce the life expectancy of the tape drive. The compatibility between drive models and cartridges is summarized in [Table 6-1](#) on page 40. Shaded boxes show the recommended media for each tape drive. Capacities assume a compression ration of 2:1.

**Table 6-1** Data cartridge compatibility

	<b>DDS-1 &amp; 2</b>	<b>DDS-3</b>	<b>DDS-4</b>	<b>DAT 72</b>	<b>DAT 160</b>
DAT 160	not supported	not supported	read/write	read/write	<b>read/write 160 GB*</b>
DAT 72	not supported	read/write	read/write	<b>72 GB*</b>	not supported
* Capacity assumes 2:1 compression.					

## Write-protecting cartridges

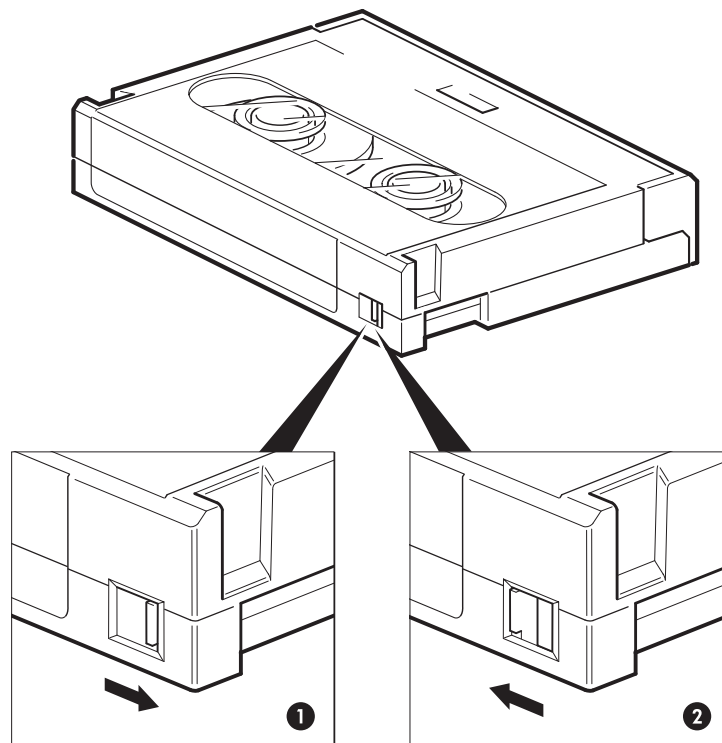
If you want to protect the data on a cartridge from being altered or overwritten, you can write-protect the cartridge.

Always remove the cartridge from the tape drive before you change the write protection.

- To write-protect a cartridge, slide the tab on the rear of the cartridge so that the recognition hole is open.
- To write-enable a cartridge, slide the tab back so that the hole is closed.

Write-protection will not protect your cartridges against magnets (or bulk erasers).





1. tab closed, cartridge write-enabled

2. tab open, cartridge write-protected

**Figure 6-1** Write protecting a cartridge

## Cleaning cartridges

**Table 6-2** Cleaning cartridge compatibility

Tape drive model	Cleaning cartridge required
DAT 160 tape drives	You must use a DAT 160 cleaning cartridge
All other DAT tape drives	You must use a standard DDS cleaning cartridge

Do not use swabs or other means of cleaning the heads. The cleaning cartridge uses a special tape to clean the tape heads. A cleaning cartridge can only be used 50 times or as instructed on the cartridge packaging. Always place a check mark in a box each time you use the cartridge to clean the drive. Replace the cleaning cartridge when all the boxes are checked. New cleaning cartridges are available from your manufacturer.

1. Insert a cleaning cartridge into the drive. The tape drive automatically loads the cartridge and cleans the heads.

At the end of the cleaning cycle, the drive ejects the cartridge. The cleaning cycle takes approximately 30-60 seconds.

If the cleaning cartridge is not ejected, it has probably expired. In this case, press the Eject button, discard the cleaning cartridge and repeat the operation with a new one.

2. Remove the cleaning cartridge from the drive.

The drive's TapeAlert feature will send a message to your backup application when the tape heads need cleaning or a cleaning cartridge has expired.

## Handling cartridges

- Do not touch the tape media.
- Do not attempt to clean the tape path or tape guides inside the cartridge.
- Do not leave cartridges in excessively dry or humid conditions.
- Do not leave cartridges in direct sunlight or in places where magnetic fields are present (for example, under telephones, next to monitors or near transformers).
- Do not drop cartridges or handle them roughly.
- Do not stick more than one label onto the cartridge label area; extra labels can cause the cartridges to jam in the drive. Stick labels onto the label area only.
- See the insert included with the tape cartridge for storage conditions.

## Getting the most out of cartridges and drives

- Use mostly the matching media type (DAT 160 media for DAT 160, DAT 72 media for DAT 72).
- Use media for the recommended number of times (DAT 160, DAT 72 =100 full backups). Overuse of the tape will cause it to degrade and possibly shed tape debris in the drive. Too many new tapes can also cause wear of the drive as they are rougher than used ones.
- Do not verify (DDS does read-after-write checking automatically).
- Do not overload the server during backups. Maximize the transfer rate (run overnight with no other processes) and use incremental backups if convenient.
- Do not overuse your tape drive—it is designed for approximately three hours of tape pulling per day, not constant usage—and clean the drive regularly. See [“Cleaning cartridges”](#) on page 41.

- If you want to bulk erase cartridges, this should be done in a controlled environment. You need to make sure there are no other cartridges with sensitive information on them anywhere near the bulk eraser when in use. All data will be lost on cartridges that are bulk erased.

## Notes

# Troubleshooting

In this chapter:

- [“General Procedure”](#) on page 45
- [“Problems with cartridges”](#) on page 46

## General Procedure

If a problem occurs, the first step is to try to establish whether the problem lies with the cartridge, the drive, the host computer and connections, or the way the system is being operated.

### Has the system just been installed?

There could be an installation problem:

1. Check through the information in the relevant installation chapter of this guide.
2. Check the power connectors.
3. Is the SCSI ID correctly set? Is there a SCSI system conflict? Has the SCSI bus been correctly terminated? See also [“SCSI configuration guide”](#) on page 49.
4. Check the environmental conditions against the specified limits.
5. Are appropriate drivers and application software installed on the host?

### Are you using new cartridges or a different brand of cartridge? Have you been using the particular cartridge for a very long time?

The problem could lie with the cartridge:

1. Check through [“Use the correct media”](#) on page 39.
2. Check that you are using a DDS-labeled cartridge—not a DAT cartridge.

3. Use the correct media type, for example:

- DAT 160 media with DAT 160 drives.
- DAT 72 media with DAT 72 drives.

Remember that although tape drives may be able to read earlier-format media, see [Table 6-1](#) on page 40, the media itself is not backward-compatible

- DAT 160 media can only be used with DAT 160 drives.
- DAT 72 media can be used with DAT 160 and DAT 72 drives.

4. Has the cartridge been write-protected, see [“Write-protecting cartridges”](#) on page 40?

5. Clean the tape heads with the cleaning cartridge, see [“Cleaning cartridges”](#) on page 41. Be sure to use the correct cleaning cartridge.

- DAT 160 cleaning cartridges with DAT 160 tape drives.
- Standard DDS cleaning cartridges with DAT 72 tape drives

6. Try the operation again.

7. If the problem still occurs, try using a different cartridge.

8. If the problem is still there, the problem probably lies with the drive or the host computer.

**Has the drive been moved recently? Have any cables been disconnected and reconnected? Has the environment changed—unusually hot, cold, damp or dry? Has there been dust or dirt near the drive. Have reasonable precautions against static been taken?**

The problem could lie with the drive:

1. Check the cables and connectors.
2. Clean the tape heads with the cleaning cartridge.
3. If the problem persists, check the environmental conditions against the specified limits (please visit the support pages at <http://www.tandbergdata.com>). Perhaps move the drive to a more suitable site.

**Has a new operating system been installed in the host computer? Has new backup software been installed?**

The problem could lie with the host or the software. Consult the computer's operating manuals, the software manual, or seek help from a service engineer.

## Problems with cartridges

If you experience any problems using branded cartridges, check:

- The cartridge case is intact and that it contains no splits, cracks or damage.
- The cartridge has been stored at the correct temperature and humidity. This prevents condensation. See the insert included with the tape cartridge for storage conditions.
- The write-protect switch is fully operational. It should move from side to side with a positive click.
- <http://www.tandbergdata.com> for more detailed troubleshooting information.

### **The cartridge is jammed**

If the cartridge is jammed or the backup application is unable to eject it, you can force eject the cartridge. Once the cartridge is successfully ejected, it is good practice to upgrade the firmware. If the failure occurs regularly, contact customer service via <http://www.tandbergdata.com>.

1. Either press and hold the Eject button on the front of the tape drive for at least 15 seconds. Or press the Eject button three times within 5 minutes.
2. Wait for the cartridge to be ejected. The drive waits until 35 seconds have passed from the time of the first press, to give the normal eject procedure a chance to proceed. After this period, it immediately releases the tape and ejects the cartridge, regardless of what operation it was performing. It is important that you allow sufficient time for the drive to complete this process. If you interrupt it, you may damage the media or the tape drive. The drive is then reset as though you had turned the power off and then on again.

You may lose data if you force eject a cartridge. The tape may also become unreadable because an EOD (End of Data) mark may not be properly written.

3. If the cartridge is still jammed, the tape drive has failed. Contact customer service.

### **The drive will not accept the cartridge (or ejects it immediately)**

The cartridge may have been damaged, for example dropped, or the drive may have a fault. If it is a cleaning cartridge, it has probably expired and should be discarded immediately.

For data cartridges:

1. Check that the drive has power (the power cable is properly connected and the Tape LED is on).
2. Check that you are using the correct media for the tape drive, see [“Use the correct media”](#) on page 39.

3. Make sure that you have loaded the cartridge with the correct orientation (see “[Loading and unloading cartridges](#)” on page 36).
4. Check for damage to your media and discard it if it is damaged.
5. Use a new or known-good piece of media and see if it loads. If it does, the original cartridge is faulty and should be discarded.
6. Check if another DAT drive of the same model will accept the cartridge. If it does, the original drive may be faulty.



# 8

## SCSI configuration guide

In this chapter:

- “[SCSI in DAT devices](#)” on page 49
- “[SCSI terminology](#)” on page 50
- “[Setting up the SCSI bus](#)” on page 50
- “[Identifying SCSI IDs](#)” on page 51
- “[Setting the SCSI ID on DAT drives](#)” on page 52
- “[SCSI termination](#)” on page 52
- “[SCSI cables](#)” on page 54

### SCSI in DAT devices

DAT tape drives are Ultra160 SCSI-2 compatible devices. They are designed to operate on a low voltage differential (LVD) SCSI interface. They are not compatible with high voltage differential (HVD) SCSI devices.

The drives support a burst transfer rate of 160 MB/sec. To benefit from this level of performance, it is important to ensure that the drives are connected to a SCSI bus of a similar or higher specification. This means that you need:

- An Ultra160 or Ultra320 SCSI host bus adapter. Ultra2 SCSI is also supported, but performance may be degraded if there are several devices on the SCSI bus.
- LVD-rated SCSI cabling and terminators. The LVD interface enables the data to be transferred at the drive's maximum rate and provides a maximum cable length of 12 meters.

We also recommend that the tape drive is connected to a dedicated host bus adapter. If you need to connect multiple devices to the bus, performance may be restricted if there are too many (3 or more) devices on the bus that are accessed simultaneously. Connecting devices of lower SCSI specification, such as Ultra2 or Ultra SCSI, may also restrict performance to your tape drive. Using Single Ended 8-Bit SCSI devices on the same bus

is not recommended, as performance will be severely impacted and complicated bus configuration is required to overcome bus termination issues.

Make sure that the last device on the SCSI bus is terminated. We recommend that you do not attach the tape drive to the same SCSI bus as the disk drive. See “[SCSI termination](#)” on page 52 for more information about terminating DAT tape drives.

## SCSI terminology

SCSI is a bus interface: all the devices are connected to a single cable (some of this may be inside and some outside the host computer's case). The connection to the host itself is known as the Host Bus Adapter (HBA). You can have several HBAs in a single computer, each with its own SCSI bus: this is a common arrangement in high-performance servers. Some host bus adapters (such as the LSI Logic LSI22320-R) have more than one SCSI bus available on a single card.

Various terms are used when describing SCSI devices. These terms relate to the factors that affect performance and cable length:

- The speed of the data bus, which may be Fast, Ultra, Ultra2, Ultra3, Ultra160 or Ultra320.
- The width of the data bus, which may be Narrow or Wide (8-Bit or 16-Bit).
- The voltage level of the interface, which may be single-ended (SE) or low voltage differential (LVD).

DAT drives are Ultra 160 SCSI devices designed to operate on a low voltage differential SCSI interface.

## Setting up the SCSI bus

Each device on a SCSI bus, including the SCSI host bus adapter (HBA), must be configured with a unique ID (identifier). The SCSI bus must be terminated.

**Note:** We recommend that a dedicated host bus adapter is used for the tape drive. A suitable adapter is available from your supplier as an accessory.

## SCSI ID numbers

For wide SCSI buses, the SCSI ID will be a number from 0 through 15, so a typical wide SCSI HBA can accommodate up to fifteen other devices. (On narrow SCSI buses, the SCSI ID is a number from 0 through 7.)

**Narrow:** 7 6 5 4 3 2 1 0  
                   High ————— priority ————— Low  
**Wide:** 7 6 5 4 3 2 1 0 15 14 13 12 11 10 9 8

Each device must have a unique SCSI ID. The drive can be assigned any unused ID between 0 and 15. Do not use SCSI ID 7, which is reserved for the SCSI controller. SCSI ID 0 is typically assigned to the boot disk and should also not be used unless the tape drive is on a dedicated SCSI bus.

SCSI ID 7 is normally reserved for the HBA because it has the highest priority on the bus. On wide buses, the priority runs from 7 (highest) to 0, then 15 down to 8 (lowest).

**Note:** As a general rule, avoid putting tape devices on the same bus as any hard disks.

## Identifying SCSI IDs

If your computer already has devices connected to the SCSI bus, you will need to know their IDs to avoid any conflict with the new tape drive. Here are some methods of finding out the information:

- Most computers display a list of SCSI devices and IDs during the boot-up process. This usually scrolls past very fast. If you press the [Pause] key, you should be able to halt the scrolling and view the list.
- On Windows systems you can use Device Manager.
- If you have Novell NetWare installed, use its LIST DEVICES command.

If none of these is available to you, try the following sources of information:

- The details of all installed devices and settings may have been written down and stored with your computer's documentation (for new computers, this is often done by the supplier).
- Your HBA's documentation should tell you which settings it uses.
- Look at each device to find out its ID. This is usually easy with external devices. With internal devices, you will probably need the help of the device's documentation to identify the SCSI ID setting, which is usually set with jumpers.

## Setting the SCSI ID on DAT drives

See the relevant chapter of this User Guide for more details. Note that host adapters check SCSI IDs only at power-on, so any changes will not take effect until the host system is power-cycled.

- On internal tape drives, set the SCSI ID by attaching or removing jumpers at the rear of the drive, see “[Check the drive's SCSI ID](#)” on page 17.
- On external tape drives, the ID is displayed on the rear panel and can be set by pressing the little buttons above and below the number (using a ball point pen), see “[Check the drive's SCSI ID](#)” on page 25.

## SCSI termination

Terminators are essential, as they provide the correct voltages on the SCSI bus and prevent unwanted signal reflections from interfering with data transfers. The rule is:

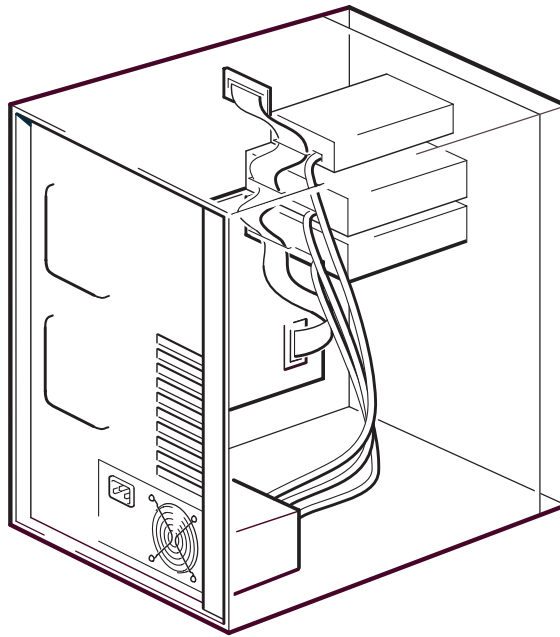
- There must be termination at both physical ends of the bus and only at the ends.

There are two main types of termination, active and passive. Active terminators reduce interference and allow faster data throughput. On devices with high transfer speeds, such as DAT devices, active termination is required, using an LVD or multimode active terminator. (Multimode terminators allow both LVD and single-ended devices to be connected to the same bus. They detect the type of bus and automatically supply the correct termination. The terminator supplied with DAT tape drives is LVD. Multimode terminators may be used instead.)

Normally the HBA forms one end of the SCSI bus and provides termination. You only need to ensure that the other end of the bus is terminated.

## Internal drives

A suitably terminated LVD internal ribbon cable is supplied with the tape drive. The terminator is usually a small, rectangular block of plastic attached to the cable end and marked 'SCSI Terminator'.



**Figure 8-1** SCSI termination in internal drives

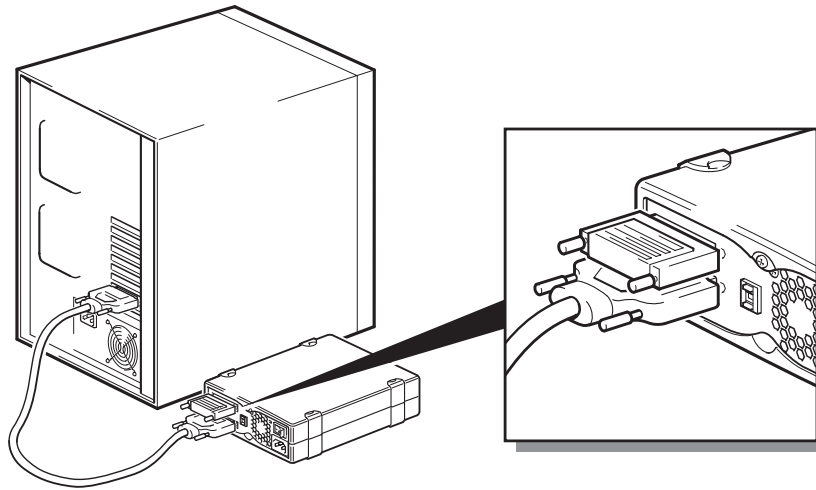
As long as this terminator is attached, you do not need to take any further action. However, if you have other devices attached to the cable, make sure that they have termination removed or disabled.

**Note:** If you have an internal and external device attached to the same SCSI bus, the HBA will be in the middle of the cable and thus its termination must be disabled. See the host bus adapter's documentation for details of how to do this.

## External drives

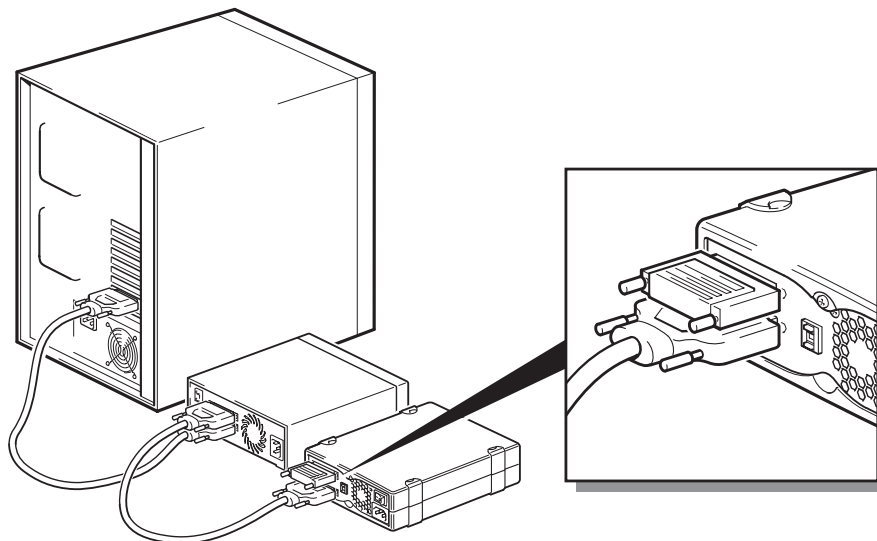
All DAT external tape drives are supplied with the appropriate cable and LVD terminators.

Make sure the terminator is firmly attached to the SCSI-OUT connector on the rear of the device when you install it. Always use the supplied LVD terminator for proper operation.



**Figure 8-2** SCSI termination in external drives

If you have more than one device on the SCSI bus, daisy-chain them by connecting a cable from the SCSI-OUT connector on the first device to the SCSI-IN connector on the second device and make sure that the second device is terminated. (Always use an LVD-rated cable and an LVD-rated or multimode terminator.)



**Figure 8-3** SCSI termination in daisy-chained external drives

## SCSI cables

Cables matter in SCSI systems. There are two factors to consider: cable length and cable quality.

### Cable length

- For single-ended SCSI with Fast devices there is a maximum permissible length of 6 meters for a single SCSI bus.

- For single-ended SCSI with Ultra devices the maximum permissible length is 3 meters for four or fewer devices, and 1.5 meters for more than four devices.
- For LVD SCSI the maximum length for a single device is 25 meters. For multiple devices, the maximum combined internal/external length is 12 meters.
- If you have a combination of LVD and SE devices on the bus, the maximum cable length reverts to the SE specification. See note on SE and LVD interfaces for more information.
- For best performance, keep lengths to a minimum, but avoid very short overall lengths (less than 0.5 meters).

### **Cable quality**

- It is important to use good quality cables. Generally speaking, cable quality affects performance and reliability. This is particularly true for external, shielded cables.
- Look after your SCSI cables. In particular, take care when connecting or disconnecting not to damage the high-density connectors. Avoid putting excessive twists in external shielded cables, as this can cause premature failure.

### **With internal devices**

For DAT internal devices, you need a SCSI ribbon cable with the correct termination. The drives have a 68-pin wide, high-density SCSI connector. A suitable cable is supplied with the tape drive. If you are using an DAT drive on an internal bus with other peripherals that run at Ultra160 speeds, it is important that a 68-pin LVD-compatible ribbon cable is used. Do not connect your tape drive to lower-rated SCSI or to narrow SCSI.

### **With external devices**

The cable provided with all DAT external tape drives and autoloaders will attach to a computer with a wide, very high density (VHD), LVDS SCSI connector.

If your server or host bus adapter is equipped with a high density (HD) wide SCSI connector, you will need to order a 68-pin VHD-to-HD converter or 68-pin VHD-to-HD cable.

## Note on SE and LVD interfaces

SE and LVD define how the signals are transmitted along the cable.

- With single-ended (SE) SCSI, each signal travels over a single wire and each signal's value is determined by comparing the signal to a paired ground wire. Signal quality tends to decrease over longer cable lengths or at increased signal speed.
- With low voltage differential (LVD) signaling, signals travel along two wires and the difference in voltage between the wire pairs determines the signal value. This enables faster data rates and longer cabling with less susceptibility to noise than SE signaling and reduced power consumption.

If you use LVD SCSI devices on the same bus as single-ended devices this will switch the LVD SCSI host adapter into single-ended mode and restrict cable length.

If you connect only LVD SCSI devices, the bus will operate in low voltage differential mode and Ultra160 speeds will be enabled. You can use a combination of Ultra160 and Ultra2 devices. Each device will operate at its optimum speed.



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